

The Corn Stalk Nitrate Test

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Several soil and plant nitrogen tests have been developed for use before planting or mid-season to help farmers decide how much nitrogen to apply to their corn. Supplementing these tests, the end-of-season corn stalk nitrate test provides a final review of a farmer's nitrogen program for the year. This test has been calibrated in Iowa and is explained fully in the Iowa State University Extension Publication PM-1584, September 2000, Agronomy 8-5, *Cornstalk testing to evaluate nitrogen management*, by A. M. Blackmer and A.P. Mallarino. (Available on the Web at <http://www.extension.iastate.edu/Publications/PM1584.pdf>). In Nebraska, research by Varvel

et al. (1997) showed that when the stalk nitrate test results were in the excess range, corn yield had reached its maximum.

What Does the Test Show?

The test indicates whether corn was over-fertilized with nitrogen during the season. Blackmer and Mallarino have calibrated the test to show low, marginal, optimal and excess stalk nitrate values. Low values indicate nitrogen may have been deficient. Excess values indicate more nitrogen was taken into the plant than was used to produce grain. Corn will continue to accumulate nitrogen past the level needed for optimum grain yield, but does not show visible symptoms of excess nitrogen. The stalk nitrate test is best used for determining if excess nitrogen was available. Visual symptoms of leaf yellowing can be used to detect moderate or severe nitrogen deficiency.

When Should the Test Be Used?

The stalk nitrate test can be used as a post mortem test to compare alternative practices. The test cannot be used to fine-tune nitrogen management in the season of use, however, it can help verify whether a particular nitrogen management program supplied sufficient nitrogen for optimum yields. This is important as producers give credit for various nitrogen sources. When nitrogen credits are given for irrigation water, previous legumes, manure, and high soil nitrate levels, the stalk test provides confirmation that these credits were actually utilized. Since the test indicates excess nitrogen, it can be used to demonstrate that nitrogen was available even when not credited. Drought or pollination problems usually cause elevated stalk nitrates late in the season.

How to Take the Test

Iowa State recommends taking the corn stalk samples any time between one and three weeks after black layer formation in 80 percent of the kernels. Newly published information

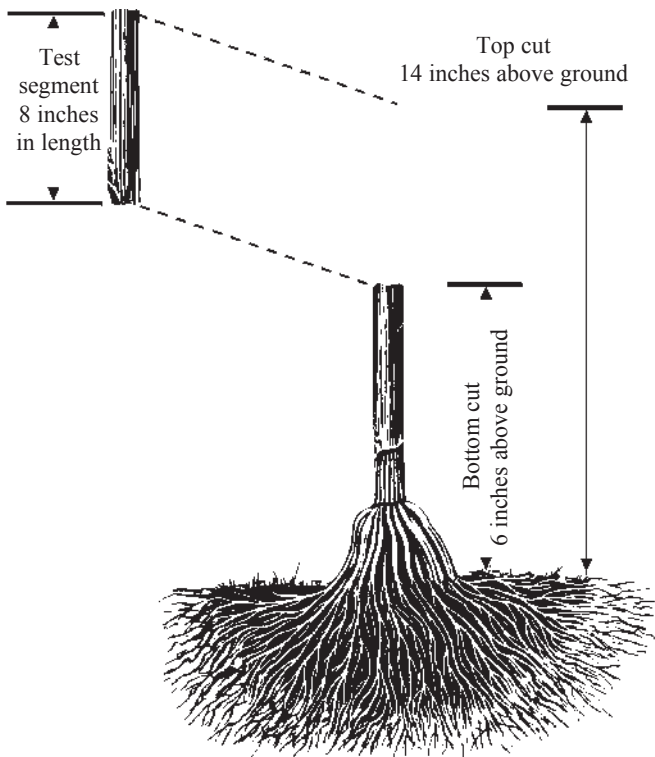


Figure 1. Eight-inch samples of the corn stalk should be taken, cutting at 6 inches and 14 inches above ground.

indicates that the stalk test can be taken as early as when the milk line is one-fourth of the way down the kernel (Fox et al., 2001).

To conduct the test:

- 1) Sample fields in a similar manner as you would with soil. Take stalks that represent the area of interest.
- 2) Remove the sheaths. Don't sample diseased stalks, stalks damaged by hail or insects, or stalks with no ear or extremely small ears.
- 3) Cut 8-inch samples of stalk from 6 inches to 14 inches above ground (*Figure 1*). Take 15 stalks per sample, keeping them cool and clean as you work.
- 4) Wrap samples in paper, rather than plastic, to avoid mold growth.
- 5) Immediately send samples to a laboratory for nitrate analysis.

Interpretation of the Test Results

<i>Plant nitrogen status</i>	<i>Stalk nitrate (ppm)</i>	<i>Management suggestions</i>
Low	0-250	High probability that nitrogen is deficient
Marginal	250-700	Nitrogen management should be re-evaluated
Optimal	700-2000	Yields are not limited by nitrogen
Excess	Greater than 2000	Nitrogen supply greater than needed

If any of the results are in either the low or excess category, conduct a thorough review of the nitrogen fertilization program to determine where improvements could be made. A number of NebGuides and other publications are available from your local county extension office to help fine-tune a nitrogen management program. Every year is different and weather conditions can affect even the best program. End-of-season testing can help determine if nitrogen problems were due to management or to unusual weather conditions.

References

- Blackmer, A.M. and A.P. Mallarino, September 2000. Corn-stalk testing to evaluate nitrogen management. Iowa State University, Extension Publication PM-1584.
- Fox, R.H., W.P. Piekielek, and K.E. Macneal. 2001. Comparison of late-seasons diagnostic tests for predicting nitrogen stalks of corn. *Agronomy Journal* 93:590-597.
- Varvel, G. E., Schepers, J. S., and Francis, D. D. 1997. Chlorophyll meter readings and stalk nitrate as complementary nitrogen indices for residual nitrogen. *Journal of Production Agriculture*. 10:147-151.

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